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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09-888,741	06/25/2001	Gene E. Lightner		9781

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[REDACTED] EXAMINER

DAVIS, RUTH A

ART UNIT	PAPER NUMBER
	1651

DATE MAILED: 03/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/888,741	LIGHTNER, GENE E.
Examiner	Art Unit	
Ruth A. Davis	1651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on _____.
 - 2a) This action is **FINAL**. 2b) This action is non-final.
 - 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.
- Disposition of Claims**
- 4) Claim(s) 1-19 is/are pending in the application.
 - 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 - 5) Claim(s) _____ is/are allowed.
 - 6) Claim(s) 1-19 is/are rejected.
 - 7) Claim(s) _____ is/are objected to.
 - 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All
 - b) Some *
 - c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 - a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 . | 6) <input type="checkbox"/> Other: _____ . |

Notice of References Cited		Application/Control No.	Applicant(s)/Patent Under Reexamination LIGHTNER, GENE E.	
		Examiner Ruth A. Davis	Art Unit 1651	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-5503996 A	04-1996	Torget et al.	
	B	US-5047332 A	09-1991	Chahal	
	C	US-6129788 A	10-2000	Liaw et al.	
	D	US-6333181 B1	12-2001	Ingram et al.	
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a))
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1 – 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 – 19 are drawn to a method for producing water soluble carbohydrates, however are rendered vague and indefinite because the claims do not clearly set forth the steps that are required in the method. Claim 1 is written such that it is confusing which limitations are actual required steps and which are functional and/or supplemental. For example, in lines 13 – 17, it is unclear what is provided and what is formed.

Claim 1 is further confusing because it is unclear which steps are producing the water soluble carbohydrates, which products contain the water soluble carbohydrates, and which products are being filtered.

In claim 1, line 6, “the extractate” lacks sufficient antecedent basis.

Claims 5 and 7 are vague and indefinite for reciting “including an individual or a combination thereof” because it is unclear if the limitation is merely exemplary and therefore not required, or if the limitation is a required feature of the claims.

In claim 7, line 1 “said enzymes” is confusing because it is unclear which enzymes are selected, since there are several recitations of enzymes in claim 1.

In claims 10 – 12 and 14 – 15, it is unclear to which water soluble carbohydrates are being referred, as there are several recitations of water soluble carbohydrates in claim 1.

In claim 13, line 1, “said enzymes derived from ultrafiltration” lacks sufficient antecedent basis. The claim appears to rather depend from claim 3.

In light of the confusing nature of the claims, Examiner has interpreted the claims as followed:

Applicant appears to claim a method for providing water soluble carbohydrates, the method comprising:

- (a) providing lignocellulose;
- (b) providing enzymes;
- (c) providing a membrane;
- (d) adding together an extractate and the lignocellulose;
- (e) hydrolyzing the combined extractate and lignocellulose at about pH 5 with enzymes, to produce a lignin residue and water soluble carbohydrates;
- (f) filtering the lignin residue from the water soluble carbohydrates, to produce (i) a filtrate (containing water soluble carbohydrates) and (ii) a filtered lignin residue;
- (g) extracting the filtered lignin residue (ii) with water, to produce a water extracted residue and an extractate (for use in step d); and
- (h) using the membrane to separate the filtrate (i) obtained in step (f) into water soluble carbohydrates and enzymes.

The hydrolyzing step (e) occurs in a vessel. Step (h) is accomplished by ultrafiltration, whereby the separated enzymes are used in steps (b) and (e). The water soluble carbohydrates obtained in step (h) are hydrolyzed and fermented to form ethanol. The lignocellulose is obtained from a biomass selected from wood, waste paper, municipal solid wastes, or combinations thereof. The lignocellulose is obtained from a dilute acid hydrolysis of a biomass, and is devoid of hemicellulose. The enzymes of steps (b), (e), and (h) are selected from cellulase, glucanohydrolase, cellobiohydrolase, or combinations thereof. The lignocellulose contains cellulose accessible to enzymes. The extractate of steps (d) and (g) contains water soluble carbohydrates. The water soluble carbohydrates contain glucose, glucose polymers, or cellobextrin. The enzymes obtained in (h) are used in step (b). The water soluble carbohydrates (or filtrate) of step (f) are absorbed by cellulose, to produce absorbed enzymes for use in hydrolysis step (e). The water soluble carbohydrates are hydrolyzed to form glucose. The method is continuous. The lignocellulose is obtained from pretreated biomass, is devoid of hemicellulose and is sterilized.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 – 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toreget et al. (US 5503996), Chahal (US 5047332) and/or Liaw et al. (US 6129788).

Applicant appears to claim a method for providing water soluble carbohydrates, the method comprising:

- (a) providing lignocellulose;
- (b) providing enzymes;
- (c) providing a membrane;
- (d) adding together an extractate and the lignocellulose;
- (e) hydrolyzing the combined extractate and lignocellulose at about pH 5 with enzymes, to produce a lignin residue and water soluble carbohydrates;
- (f) filtering the lignin residue from the water soluble carbohydrates, to produce (i) a filtrate (containing water soluble carbohydrates) and (ii) a filtered lignin residue;
- (g) extracting the filtered lignin residue (ii) with water, to produce a water extracted residue and an extractate (for use in step d); and
- (h) using the membrane to separate the filtrate (i) obtained in step (f) into water soluble carbohydrates and enzymes.

Specifically, the hydrolyzing step (e) occurs in a vessel; the membrane separation step (h) is accomplished by ultrafiltration, whereby the separated enzymes are used in steps (b) and (c); the enzymes of steps (b), (e), and (h) are selected from cellulase, glucanohydrolase, cellobiohydrolase, or combinations thereof; the enzymes obtained in (h) are used in step (b); and the method is continuous. The water soluble carbohydrates obtained in step (h) are further hydrolyzed and fermented to form ethanol; they contain glucose, glucose polymers, and

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cellodextrin; and are hydrolyzed to form glucose. The water soluble carbohydrates (or filtrate) of step (f) are absorbed by cellulose, to produce absorbed enzymes for use in hydrolysis step (e). The lignocellulose is obtained from a biomass selected from wood, waste paper, municipal solid wastes, or combinations thereof; is obtained from a dilute acid hydrolysis of a biomass, and is devoid of hemicellulose; contains cellulose accessible to enzymes; is obtained from pretreated biomass; is devoid of hemicellulose; and is sterilized. The extractate of steps (d) and (g) contains water soluble carbohydrates.

Torget teaches methods wherein lignocellulose is prehydrolyzed with acidic solutions to remove the water soluble carbohydrates (abstract) and methods for enzymatically producing sugars (water soluble carbohydrates) from the pretreated lignocelluloses (col.5 line 9-11). The lignocellulose is obtained from wood, waste paper and municipal waste (col.1 line 20-23) and the process primarily produces glucose (col.14 line 21-22). The enzymes of the method are named to include cellulase, cellbiohydrolase and endoglucanase (or glucanohydrolase) are named to hydrolyze cellulose (col.2 line 48-50). The hemicellulose and/or lignin is removed from the lignocellulose (col.2 line 66-col.3 line 2) via acid hydrolysis, rendering the cellulose digestible (or accessible) to cellulase (col.3 line 5-8, col.6 line 37-41). The methods include further treating the lignin containing fractions (col.7 line 51-52) and the sugar (water soluble carbohydrates) is separated form the residues via filtration (col.14 line 15-17). Torget further teaches that ethanol can be produced from the lignocellulose biomass (col.1 line 53-54); specifically that cellulose is hydrolyzed to produce glucose, which is fermented to produce ethanol (col.2 line 17-20). See claims.

Chahal teaches methods wherein lignocellulose biomasses are pretreated and fractioned into cellulose, lignin and hemicellulose (abstract). The celluloses are hydrolyzed with cellulase prepared from cellulose, to prepare glucose, which is further fermented to produce alcohol (abstract), specifically ethanol (col.1 line 10-13). The lignocellulose is derived from wood, paper and municipal wastes (col.1 line 21-24, col.4 line 63-68), and is pretreated to remove almost all hemicellulose (col.3 line 2 line 14-16). Specifically, lignocellulose biomass is enzymatically hydrolyzed with cellulase to make glucose and a hydrosylate, wherein the glucose can be fermented to produce ethanol. More cellulose (or a filtrate containing water soluble carbohydrates) is added to give cellulase enzymes, which are used in cellulose hydrolysis to produce glucose (col.5 line 5-51). Moreover, the cellulase, cellulose and water soluble carbohydrates are recycled back into the method steps. The substrates are sterilized during pretreatment (example 1).

Liaw teaches methods for producing saccharides (water soluble carbohydrates) from starch wherein the methods comprise enzymatically saccharifying (or hydrolyzing, see col.4 line 24-27) starch into cyclodextrins, followed by membrane separation and re-circulation of the hydrolyzing enzyme (col.1 line 14-25, col.4 line 13-23). Liaw teaches that when producing the sugar polymers, (i.e. clycodextrin), the hydrolyzing step is followed by an ultrafiltration step (col.4 line 39-43). Specifically, the hydrolyzing step produces the feed stream (or filtrate) that is to be separated (via ultrafiltration), and that the retenate (or water soluble carbohydrates and enzymes) is re-circulated to the hydrolyzing step (col.5 line 54-57, col.10 line 5-17). The methods are conducted at about pH 5 for optimum enzyme stability (col.2 line 1, col.8 line1).

Although each of the claimed steps are not specifically taught by the references, it would have been well within the purview of one of ordinary skill in the art to optimize the various result effective variables as claimed (i.e. filtering the various residues, which filtrate/extractate contains water soluble carbohydrates, the specific glucose polymers, etc.) as a matter of routine practice and/or experimentation. Moreover, at the time of the claimed invention, one of ordinary skill in the art would have been motivated by any of the above references, alone and in combination, to practice the method as claimed, with a reasonable expectation for successfully providing water soluble carbohydrates.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ruth A. Davis whose telephone number is 703-308-6310. The examiner can normally be reached on M-H (7:00-4:30); altn. F (7:00-3:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Wityshyn can be reached on 703-308-0196. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-4242 for regular communications and 703-308-4242 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0196.

Ruth A. Davis; rad
March 21, 2003



LEON B. LANKFORD, JR.
PRIMARY EXAMINER